More Quality – Higher Price?

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ABSTRACT,
A relation between price and quality and vice versa is generally widely believed. In theory the relationship had been studied a lot and still there are different notions. Thus this study investigates is a relationship between quality and price exists and what direction it has. Current works provide contrasting evidence on the direction of this relationship based on different; micro economics and marketing´s cost-plus pricing technique assumes a positive relation; total cost of ownership and information asymmetry can either assume a negative relationship or a non existent relationship. Within this study an empirical test of a dataset of 400 tenders retrieved from an online system for electronic tenders is used. In contrast to former researches the tenders represent the whole market instead of only one industry, company or product group. An initial analysis provides slopes close to zero with low significance on correlation. Theory suggests dividing the data into four different homogenous groups: service and products, industries, product groups, amount of bids, tenders by themselves. Each segment supports the initial analysis of no measurable relation with having an almost null coefficient and no significant correlation in most of the cases. Conclusion may argue for questioning the relevance of theoretical concepts like micro economics and marketing pricing as they should explain a relationship between quality and price.

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Quality, Price, relationship, tenders, public procurement, bids

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1. PROBLEM ANALYSIS

The underlying and widely believed assumption is that high quality mostly results in high prices. This can be explained by the fact that adding value to a product at a manufacturer is associated with increasing quality for which higher investments have to be done. This ultimately will lead to higher costs in the value adding process and usually (as a company's most essential purpose is to be profitable) these higher costs are to be expected to be found in the price when the company sells the product to its customers. A company needs to be profitable or at a minimum have to have a return on investment of zero to become sustainable. This explains even if the firm is not making any profits it has to cover at least its costs to stay alive. Higher costs for improved quality therefore lead to higher costs which lead to higher prices the product has to be sold for (Hayes & Wheelwright, 1984; Olson, 1977). This basic logic from the suppler side has already been examined a lot in several researches and articles (Gerstner, 1985; Zeithaml, 1988). In their studies perfect information of customers about the product is assumed and thus higher quality leads to higher prices (Chan & Wildt, 1994). In contrast to a positive relationship other researches found that the market is imperfect in information, the so-called information asymmetry. Based on information asymmetry consumers do not recognize the whole quality of products, therefore the relationship between price and quality is also recognized to be nonexistent (Wolinsky, 1983).

Some other studies even found a negative relationship between quality and price (Curry & Riesz, 1988; Lichtenstein & Burton, 1989). Curry and Riesz (1988) states significant correlation shifts over the product life time cycle. As a result some products started with a negative relation between price and quality and ended positive and vice versa until maturity of products. Another perspective on a negative relationship between quality and prices is supported by Horn et al. (2013) who examined long- term costs of contracts with low quality suppliers, which lead in the end due to resourcing and reallocating to other suppliers to higher total costs. Nonetheless Horn´s et al. concept is only for theoretical background that from different types of researches and time periods correlations between quality and prices differ. Moreover highly qualitative products can be cheaper than products with lower quality due to the expertise and knowledge some suppliers have. From this argumentation even with a higher quality the costs may not rise due to efficiency in purchasing or production As an example, when an experienced supplier is using a cost plus pricing model and have a low profit margin the price can be even cheaper than for a low quality supplied good or service. Literature indicates that quality price relations cannot be universally applied to all purchases and still a lot of different opportunities towards the relationship exist.

To understand the different directions of relationships between quality and price those have been observed by different authors, quality has to be defined and explained. To give a clear understanding about what quality is and how it is defined a derivation from microeconomics is used. In micro economy a homogenous market is assumed to be fully transparent and all goods and services are equal amongst each other. This explains the basic idea of when quantity raises prices will decrease. But the real world has shown that the market is not transparent and information asymmetry exists as well as goods and services differ from one supplier to another (Mishra, Heide & Cort, 1998). Customer´s perceived value of products and services fluctuate within desired purchases. This perceived value is determined by desired quality aspects. Thus quality is a direct driver for the perceived value of a good or service and directly influences purchasing decisions (Wadman, 2016). Additionally the derivation implies that what is recognized as quality will also differ amongst customers. Quality cannot be determined as one best overall quality, as needs and requirements on quality aspects vary. Thus the quality and price relationship is highly dependent on what the customer expects and needs from the desired purchase.

All in all, literature and recent studies show that the relationship of price and quality can either be positive, non-existent or even negative. This can be explained by different definitions of quality, by the subjective percipience of quality which differs from customer to customer. Moreover by heterogeneous and non-comparable data analysis, and if to look solely on the price or also on total lifetime costs.

Thus in this paper the following research question will be investigated:

Does a correlation exist between quality and price in bids received in tenders and if so what direction will it have?

The paper begins with an introduction to the problem derived from existing literature. In the next section the methodology and operationalization will be explained. Afterwards an initial data analysis is stated which will then be followed by a deeper view on existing literature of the topic, to provide a complete picture and to guide towards further data analysis and results. In the end implications for buyers and suppliers will be discussed. The paper will be finalized by mentioning limitations and indicate further research recommendations.

2. METHODOLOGY AND OPERATIONALIZATION

2.1 Study Subject

The data which will be examined is provided by Negometrix. Negometrix is a Dutch company offering an electronic platform for tenders in public as well as in private sectors since 2000. Users of the system are mainly out of the Netherlands, but also users from other 33 countries worldwide are registered in the system. Previous research indicates the relationship between price and quality in a specific context, like within one industry or firm.

In contrast the database of this paper is based from the whole market and not any industry, product group or other specifications except for being tenders. Thus an initial analysis has been provided in the next section to indicate further progress with the data. Still questions are open, if to segment data into relevant homogenous categories to further investigate the research question.

2.2 Independent Variable

Quality is the independent variable which defines the price to be the dependent variable. This is because I expect the quality to influence the price and not other way around. Based on the quality of a product the price will be adjusted, as discussed in the problem analysis a higher quality is assumed to have a higher investments or costs for the supplier which affects as a result the price to be higher as well (Gerstner, 1985; Zeithaml, 1988). Otherwise if the price is not influenced by quality aspects this would imply that the price is not be driven by internal costs of the supplier. To operationalize the independent variable the offer with the best quality score is set to a maximum of 100%. Based on this maximum score other bids within this tender are recoded on how much percentage they scored in comparison to the best scored quality. Reason for this recoding is that some buyers set impossible quality performance requirements. Thus to make all tenders comparable a recoding is needed. Within the scope of this research other independent variables which might influence the price are not taken into

account. The formula for the independent variable is calculated for each tender:

$$Quality_{Rate}=100\% \times Quality_i / Quality_{Max}$$

As indicated later in this paper quality can be recognized in different ways. Quality measures in tenders not only consists of what is generally related to direct quality of a product or service, but quality in tenders can be a combination of several factors, which the buyer expects to be quality for instance delivery time, after sales support, guarantee periods and further more.

2.3 Dependent Variable

Price is dependent on quality when assuming that the quality will determine the quality. Price is recoded the same way as quality. The highest price across the bids within each tender is given a percentage score of 100%. Again all other prices within the same tender are determined percentile from this score. The reason for this recoding is that each tender varies in prices from a few Euros up to several millions Euros for further investigation on the data a comparable basis has to be made. The formula for the dependent variable is calculated for each tender:

$$Price_{Rate}=100\% \times Price_i / Price_{Max}$$

2.4 Data Collection

The data which will be examined is provided by Negometrix. Negometrix is a Dutch company offering an electronic platform for tenders in public as well as in private sectors. As a database 400 tenders with 1995 offers are available which are randomly selected from all tenders in the system. Tenders in the electricity sector are dismissed due to have a negative price and are treated as a special case within tenders. Also within the 400 tenders too less tenders of electricity are present to investigate on that. The datasets consists of several variables: a tender ID, to give a unique identification number for each tender; the weight of price and quality for each tender; the score of quality in percentages for each offer; and the price for each offer. The data have been provided in Excel and has been transformed into SPSS for further analyses. Additionally for further investigations on industry specific correlations the product group has been added manually for each tender, by searching each tender ID in the system and gather the related industry of the tender out of Negometrix´s system. Both variables quality and prices are retrieved as raw data from the bids. Within the process of a tender usually the price and quality is recalculated into scores to award the supplier with the highest score. Different scoring models are used by Negometrix, like weighted average score, log score, super formula, utility index, value based award and low bid scoring. Based on the chosen scoring models different ranks of suppliers occur and guide towards the best supplier to be awarded with the contract. Considering that the scoring models will only lead to different ranks for the further progress of selecting the best supplier, scoring models do not influence the quality requirements from the buyer and thus not the variable quality. Finally within this paper no further attention is given to the scores as the aim of this paper is to answer the question of a relationship between quality and prices in its raw form rather than how different scoring models will lead to different winning bids within a tender.

3. INITIAL ANALYSIS

After recoding the data as explained in the operationalization regression analyses are made for each tender. This first analysis suggests that the correlation varies randomly across tenders. 46% of the tenders have a positive correlation with an average of 0,54 whereas the rest of 54% has negative correlations with an average of -0,6 (Figure 1). Only 346 tenders are considered since a correlation analysis with 2 or less bids is not meaningful. Additionally tenders have not been tested by significance yet. Regardless the first analysis indicates a slightly low negative correlation which is almost zero between quality and price.

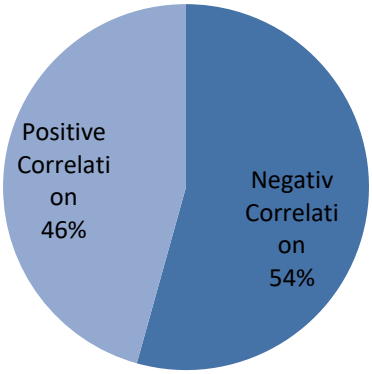

Figure 1. Tenders Correlation between quality and price.

Another perspective is that tenders are homogenous and comparable, therefore a regression analysis including all bids leads to positive Pearson correlation of 0,069 which is two-tailed significant to an alpha of 0,05 (Table 1), and a even higher correlation is measured by Spearman-Rho with 0,113 and a two-tailed significance lower than alpha 0,01 (Table 2). As Spearman-Rho is higher than Pearson linearity is low but still the correlation is monotonic, which means that when quality raises also the prices tend to be increased.

Table 1. Pearson correlation for all bids

Korrelationen

		Price Rate	Quality Rate
Price Rate	Korrelation nach Pearson	1	,069**
	Signifikanz (2-seitig)		,002
	N	1946	1910
Quality Rate	Korrelation nach Pearson	,069**	1
	Signifikanz (2-seitig)	,002	
	N	1910	1910

**. Die Korrelation ist auf dem Niveau von 0,01 (2-seitig) signifikant.

Table 2. Spearman-Rho correlation for all bids

Korrelationen

			Price Rate	Quality Rate
Spearman-Rho	Price Rate	Korrelationskoeffizient	1,000	,113**
		Sig. (2-seitig)	.	,000
		N	1946	1910
	Quality Rate	Korrelationskoeffizient	,113**	1,000
		Sig. (2-seitig)	,000	.
		N	1910	1910

**. Die Korrelation ist auf dem 0,01 Niveau signifikant (zweiseitig).

This correlation is visualized in the scatterplot presented in Figure 2. The recoded variables into percentage rates lead to a lot of bids which receive 100% at least one in each tender for quality and for price. To provide a better overview all bids within a tender are subtracted by the average score of quality or price within a tender. No significant correlation can be observed.

Both methods prove that as expected for meaningful analyses the data have to further be investigated. When assuming the cost-plus method to be a valid technique for pricing strategies, following assumptions needs to be examined: Either the data is not comparable as it is not comparable within its heterogeneity nature of different tenders; or buyers set misleading quality requirements; prices might not derive from cost-plus pricing methods, but do have a another driver, for instance strategic prices or miscalculations.

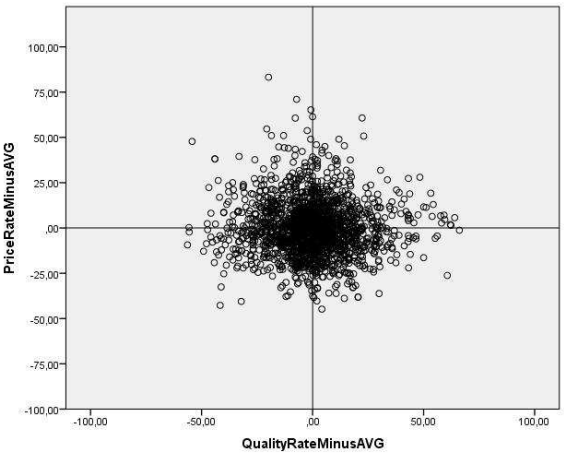

Figure 2. Scatterplot of all bids

4. PREVIOUS RESEARCH

4.1 Quality

Although quality has always been a topic, there might be no universal definition of quality in literature. According to the American Society of Quality (ASQ) quality is a subjective term which varies across sectors and individuals. Nonetheless two meanings from technical nature are stated: 1. the characteristics of a product or service that bear on its ability to satisfy stated or implied requirements/needs; and 2. a product or service free of defects. The International Organization for Standardization (ISO) defines quality as the degree to which the characteristics of a product or service fulfills requirements. According to Drucker , 1985 quality is not supplier dependent, but quality is about what the buyer is willing to pay for a desired need. In the context of tenders' quality can be defined as the individual required set of characteristics of a desired product or service.

When talking about quality the Kano model introduced by Kano, Seraku, Takahashi and Tsuji, 1984 is commonly used to assess quality levels of suppliers. When comparing the Kano model to tenders some similarities and differences attract attention. Based on the Kano model equal to buyers´ requirements in tenders there are some expected "must be" requirements which have to be met by the supplier else the supplier is kicked out immediately. This is the lowest level a supplier needs to fulfill in terms of quality to stay in competition. On the next level "satisfiers" leads to an normal state of needs asked by the buyer. Exciting needs are meet the highest level of customer expectations and is termed as the "wow" level (Kano et al., 1984). Arguable the last level of satisfaction in quality might not fit to tenders, as tenders have a set of desired quality aspects which are preliminary determined by the buyer in advance. If requirements are not asked the supplier cannot also not get any scores to be finally awarded.

4.2 Pricing from a Marketing Perspective

For further investigation we have to understand what prices are and where they come from. The marketing perspective divides three major types of pricing objectives, the profit-orientated, sales-orientated and the status quo-orientated (McCarthy and Perrault, 2002). The profit-orientated approach is the most popular across marketers and commonly firms tend to use it with the objective to receive a return on investment. Sales-oriented pricing strategies aim to increase sales and market share. The status quo-oriented pricing is especially common in homogenous markets where products or services have little difference and prices almost are equal, for instance for commodity groups. According to McCarthy and Perrault, 2002 the most common approach is the profit-oriented and thus might also have the highest impact in our study. According to Blythe, 2006 cost-based pricing methods are usually used for the profit-oriented objective. Mostly used methods are the cost-plus pricing and mark-up pricing. Both pricing techniques consider the costs of a product or and add a profit margin or mark-up on top of its costs. Blythe, 2002 also states that the cost-plus approach is often used by manufacturers and engineers. Certainly these statements support a positive relationship between prices and quality. As an example for cost-plus pricing, a better quality of material, which costs more to purchase or to produce will ultimately lead to higher costs for the supplier which in the end will be added to the end price the buyer has to pay. Nonetheless we may have to divide data into categories of different homogenous product groups. A first indication on how to segment the data will be a division consisting of different industries. Industries can be either count for the buying organization or the supplier. For this research the segmentation is made on the supplier side.

When dividing the data into homogenous groups we define different industries as a means for homogeneity. The Standard Industrial Classification (SIC) provides the basis for a division of different industries. The International SIC has been elaborated by the United Nations and divide economic activities into 17 industries: Agriculture, hunting, and forestry; Fishing; Mining and quarrying; Manufacturing; Electricity, gas, and water supply; Construction; Wholesale and retail trade and repair; Hotels and restaurants; Transport, storage, and communication; Financial intermediation (including banking); Real estate, renting, and business activities; Public administration and defence, compulsory social security; Education; Health and social work; Community, social, and personal service activities; Private households with employees; Extra-territorial organizations and bodies.

Another effect on prices is indicated by the experience curve. According to Day and Montgomery, 1983 learning, technological improvements and economies of scale effect costs. During maturity of firms, goods and services costs are expected to decline as expertise leads to less failures and increased sales leads to economy of scale which decrease costs. Arguable Hlavacek, 1984 indicates that the learning curve only yield results for established products where gains through experience do not diminish rapidly. Nonetheless the learning curve is an argument for a negative relationship between quality and price. The mature the market, the more experience the firm is and the less innovative a product is the more effects of learning curve might be relevant.

4.3 Information Asymmetry

A weak to no relation at all between quality and price is supported by the information asymmetry theory (Kirchler, Fischer & Hölzl, 2010; Wolinsky, 1983). According to Morris and Bronson, 1969 imperfect markets are the cause for this weak correlation. Micro economy often assumes perfect markets for easier modeling of the real world. Within a perfect market consumers are fully informed about suppliers and have access to all relevant information needed and full transparency

exists. In reality this is not be the case and consumers do not have full information, an information asymmetry exists (Gerstner, 1985). Derived from the information asymmetry theory buyers do not have full transparency of quality and thus it is hard to indicate a relation between price and quality based on information asymmetry. This is supported by various scholars who state that an interpretation of information asymmetry towards a quality price correlation is invalid to evaluate buying decisions, as this relationship does not lead to an indicator for how often a product or service is bought (Rachford, Agrawal, Grimm & Srinivasan, 1996; Ackerman & Yamada, 1984). On the contrary buyers might be tricked by their faith a high price indicate also a high quality, firms who sell their products for a high price make their customers believe they buy a high quality (Leavitt, 1954; Rao & Monroe, 1989; Tull, Boring, & Gonsior, 1964). Völckner and Hofmann, 2007 found these to be true especially in service sector as objective assessment of quality is harder for services than for products. This suggests that not even for different industries the data have to be selected but also for services and products.

4.4 Previous Research Recommendations

Based on previous research in the field of testing a relationship between quality and price indications about further data division are derived. Focus is given to differences in datasets, data collection, industry of the data, and other segmentations and limitations of the data. Additionally attention is given to further research recommendations and limitations of the different articles.

According to Gerstner, 1985 who measured correlations for different products expects higher price-quality relations for products where quality is easier observable. Within the presented study quality is measured through expert´s knowledge, laboratory tests, controlled-used test and users` opinions. In tenders quality requirements are predetermined and therefore are expected to be the most relevant and important needs of the buyer, which is expected to be easier observable quality. Moreover Gerstner suggests using data in product classes which are more homogenous and may have also a unidimensional quality measure (Gerstner, 1985).

In the study of Zeithaml, 1988 he states about perceived quality, which is individual dependent and subjective which may lead to different results on the price-quality relationship. Although he states a lot about positive correlations, the article also implies that correlation may vary across products, brands and some other attributes. A similar limitation is presented by Lichtenstein and Burton, 1989 who state that the individual taste of consumers is not universal applicable. Advised by them is to assess quality measurements which are of general nature.

Völckner and Hofmann, 2007 used a meta-analysis for measuring the positive relation between quality and price. They state that researches with meta-data yet has only be either observed for positive or negative correlation but not both at once. Thus the data in this paper will not be divided by a negative and positive correlation in advance to analyze both directions at once.

According to Curry and Riesz, 1988 a negative correlation can be found for services like: luggage, ranges and typewriters. Whereas a positive is found for: matrasses and fire extinguishers. They limit their study to consumer reports which leads to three measures they used. Consumer reports are also expected to be subjective.

Another perspective is given by Horn et al., 2013, in contrast to the former scholars the “price” is referred to costs and also not the one time costs, when the product is initially purchased is used but the total cost over time.

Derived from previous research additional attention is given on to the following categories: set homogenous groups for unidimensional quality measures; test for positive correlation as well as negative and no correlation at all within one databasis; divide into services and goods, and different productgroups.

5. DATA ANALYSIS AND SEGMENTATION

The data will be further categorized by the following categories: industry dependent, service or product, homogenous groups, amount of bids per tender. Finally a regression analysis is made for each tender itself based on the amount of bids retrieved.

5.1 Industries

For the division into different industries, the available subjects of the tenders are translated from Dutch to English via Google translation. Nonetheless during this process wrong translations could lead to a wrong classification of the industry. To provide a most reliable classification each translation is double-checked through another online translation website (www.leo.org). After segmentation we have the following segments. 28,4% of all tenders can be found in the industry for community, social and personal service activities and is the highest in industry dependent categorization. Second manufacturing counts for 14,1% of all the data. Education and construction categorized counts for around 7% each. All other industries are represented less than 7% per industry within the whole dataset or not even found within a tender.

5.2 Homogenous Groups

Additional segmentation of the data is into comparable groups which are about to be similar in requirements of quality. This division of the data is also suggested by Gerstner, 1985, as he expects a higher relation between price and quality for homogenous products. In this case two groups will be set on the one hand labor based on a hourly wage and on the other hand information technology products. For Labor homogeneity is expected out of equal quality requirements. For instance curriculum vitae are very well comparable across each other as it has a standard format for content. Still motivation letters and professions may lead to different quality requirements and assessments. Especially for a required motivation letter a high subjective assessment can be argued. For information technology a good objective comparability is expected that leads to sufficient assessment criteria on quality. Within the dataset we have 78 cases for hired labor and 44 cases for information technology.

5.3 Amount of Bids per Tender

Another categorization of the data is grounded on tenders on their own. Different amounts of bids for each tender are estimated to have an impact on the significant level. Especially a low amount of bids is expected to have a low significance. Thus three ranges of bids for a tender are of investigation: less than or equal as 3; 4 to 9; and 10 or more bids. 43,2 % of all tenders have 3 or less bids only, whereas most of the tenders received 4 to 9 bids with 48,1%. In the end only 8,6% of all tenders have 10 and more bids.

5.4 Tenders by Themselves

The last segmentation will be very narrow, each tender will be observed for any correlation in itself. This is the highest degree of splitting the data into homogenous groups, as within each tender the same quality requirements are set, the same purchaser is buying and the same product or service is

purchased. Many of the tenders do not have enough bids to be reliable. For this reason only tenders with the highest amount of bids are taken for any regression analysis. For this measure we use the 8,6% of all tenders which have 10 and more bids.

6. RESULTS

First investigation is with dividing services and products into separate categories. Still both have a small positive Pearson correlation with 0,111 for products and only 0,022 for services (Appendix A). Not only that the correlation is higher for products but also it is significant with a p-value of 0,017 whereas no significant correlation can be measured for services. These findings are also supported by Völckner and Hofmann, 2007 who indicate a much harder assessment of quality requirements for services than for products. Berry, 1980 distinguishes services from products to be more intangible, simultaneously produced and consumed and less standardized as tangible goods, which leads to a higher degree of customers` uncertainty in quality for services. According to Zeithaml, 1981 qualities of services are easier to be determined when actually used, products do already have a high degree of determined quality before being purchased. When having a look at the scatterplot of products presented in Figure 3, still little reliability can be observed as bids are widely spread.

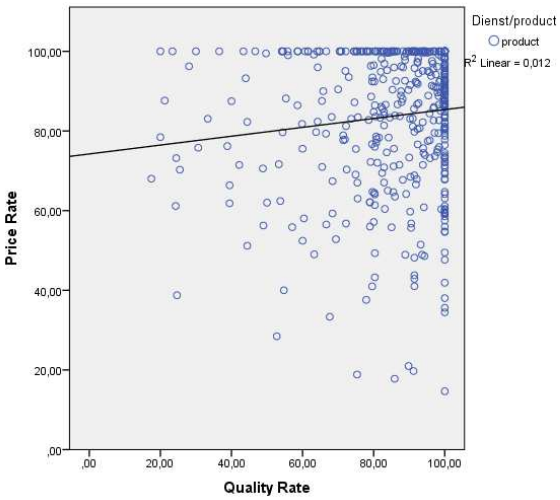

Figure 3, Scatterplot Products

When analyzing the data for the different SIC industries we get a broad range of different correlations. Gradients have a range from -0,869 for tenders from the manufacturing industry up to 1 for banking (Table 5). Due to multicollinearity issues occur for community, social and personal service activities with an regression coefficient over 1. Still correlation is only significant if the confidence level is lowered to 90% to an alpha = 0,10 for the construction industry p = 0,067. The regression coefficient for manufacturing is negative with a value of 0,463. Even when significance is observed for purchased constructions, its scatter diagram indicates a low reliability of the data as the values are widely spread (Figure 5). Thus a reliable correlation between quality and price cannot be found when dividing the data into different industries.

Table 3, correlation for industries

Industry	Modell		Nicht standardisierte Koeffizienten: Regressionskoeffizient B	Nicht standardisierte Koeffizienten: Standardfehler	Standardisierte Koeffizienten: Beta	T	Sig.
Electricity, gas and water supply	1	(Konstante)	87,882	15,811		5,558	,031
		Quality Rate	,084	,200	,286	,421	,714
Health and social work	1	(Konstante)	96,951	104,236		,930	,523
		Quality Rate	-,050	1,089	-,046	-,046	,971
Wholesale and retail trade and repair	1	(Konstante)	69,433	77,025		,901	,533
		Quality Rate	,049	,889	,055	,055	,965
Real estate, renting and business activities	1	(Konstante)	74,781	19,727		3,791	,063
		Quality Rate	,124	,237	,348	,525	,652
Community, social and personal service activities	1	(Konstante)	-27,373	64,064		-,427	,682
		Quality Rate	1,194	,653	,568	1,828	,110
Public administration and defence, compulsory social security	1	(Konstante)	120,544	20,834		5,786	,109
		Quality Rate	-,270	,227	-,765	-1,188	,445
Education	1	(Konstante)	90,253	652,179		,138	,912
		Quality Rate	-,297	6,812	-,044	-,044	,972
Manufacturing	1	(Konstante)	122,488	17,070		7,175	,019
		Quality Rate	-,505	,204	-,869	-2,484	,131
Financial intermediation (including banking)	1	(Konstante)	70,749	,000		.	.
		Quality Rate	,293	,000	1,000	.	.
Transport, storage and communication	1	(Konstante)	111,407	17,186		6,483	,007
		Quality Rate	-,226	,199	-,550	-1,140	,337
Construction	1	(Konstante)					
		Quality Rate	,463	,208	,674	2,232	,067
Hotels and restaurant	1	(Konstante)	96,882	43,651		2,219	,269
		Quality Rate	-,109	,535	-,199	-,203	,872

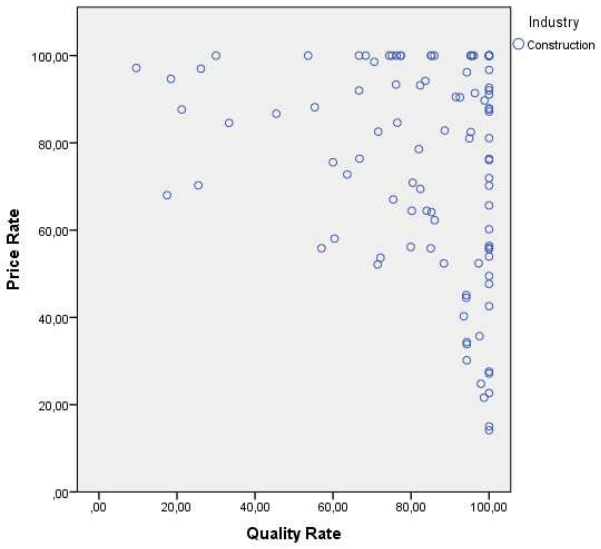

Figure 4, Scatterplot construction industry

Further segmentation of the data is done into homogenous groups of tenders by selecting tenders for hiring staff and tenders in information and communication technology. Again correlation are low with 0,48 for hired employees and -0,109 for ICT (Table 4).

Table 4, correlation for Staff and ICT

Modell		Nicht standardisierte Koeffizienten: Regressionskoeffizient B	Nicht standardisierte Koeffizienten: Standardfehler	Standardisierte Koeffizienten: Beta	T	Sig.
Staff	(Konstante)	72,329	1,552		46,607	,000
	Quality Rate	,048	,022	,081	2,224	,026
ICT	(Konstante)	86,781	7,088		12,243	,000
	Quality Rate	-,109	,082	-,102	-1,333	,184

A segmentation of the data based on the amount of bids within each tender indicates that there is a negative correlation. An increasing significance is found for tenders with a higher

amount of bids, which indicates a higher significance the more bids are present. Nonetheless the measured correlation is almost zero which implies that independent of the quality a price is offered by suppliers. The corresponding results can be found in Table 5.

Table 5, correlation amount of bids

Modell		Nicht standardisierte Koeffizienten: Regressions koeffizientB	Nicht standardisierte Koeffizienten: Standardfehler	Standardisierte Koeffizienten: Beta	T	Sig.
3 bids or less	(Konstante)	87,398	5,251		16,645	,000
	Quality Rate	-,013	,058	-,011	-,217	,829
4 to 9 bids	(Konstante)	80,087	2,938		27,255	,000
	Quality Rate	-,024	,035	-,023	-,700	,484
10 or more	(Konstante)	76,226	1,746		43,660	,000
	Quality Rate	-,066	,027	-,099	-2,444	,015

Within the analysis for each tender itself which have 10 or more bids (Figure 5), we found a high variation across correlations. Again no reliable correlation can be found as the mean regression coefficient B is -0,025 for the selected tenders. Also only 4 out 33 cases have a p-value lower than alpha = 0,05. These 4 cases have correlations of 0,278, 0,326, 0,379 and -0,702. Thus even the correlations of significant cases have no similar values of coefficients.

The research question if a correlation does exist between quality and price in bids received in tenders and if it exists, what direction does it have is denied. No reliable correlations can be found in the data to confirm the direct relationship of quality as a driver for the price. Even when dividing the data into comparable groups no significant correlation can be found. Which leads to the final statement that in tenders prices are not dependent on qualities, neither if the market is measured as a whole, nor when tenders are being grouped in: service and products; industries; homogenous groups; amount of bids per tender; and tenders on their own. Further implications for theory and managers will be discussed in the next chapter.

7. DISCUSSION & IMPLICATIONS

Theory suggests dividing the data into homogenous segments (Gerstner, 1985; Curry & Riesz, 1988). A weak correlation of 0,069 for Pearson is found without any grouping of data. Thus data have been analyzed for different categorization of data. Still no relevant correlation is observed for any of the groups. Within this dataset tenders in themselves are expected to be most homogenous, they have equal conditions for any supplier, like same customer, same quality requirements and the same context. In contrast to Gerstner, 1985 who found a positive correlation for homogenous groups, we conclude that only 4 out of 33 homogenous groups have a significant correlation, which is less than 10 percent of all gathered tenders. Three of them are weakly positive and one is strongly negative. Validity is low as they do not represent the data and are more expected to fit randomly to our research question as 90% of the other groups are non significant and they also have correlations which are almost zero. In summary we conclude that homogeneity in tenders will neither affect the degree of significance nor strengthen correlations. Also the homogenous data proves the validity of our initial analysis where no division of the data is made and correlation was almost zero, too.

Even when there is no correlation between quality and price found within the data analysis, there might be other parameters and factors which are not considered in this study yet (Zeithaml,

Figure 5. Correlation for tenders with 10 or more bids

tender ID	Modell		Nicht standardisierte Koeffizienten: Regressions koeffizientB	Nicht standardisierte Koeffizienten: Standardfehler	Standardisierte Koeffizienten: Beta	T	Sig.
689	1	(Konstante)	141,473	23,555		6,006	,000
		Quality Rate	-,702	,288	-,652	-2,435	,041
929	1	(Konstante)	59,382	5,303		11,197	,000
		Quality Rate	,153	,086	,323	1,774	,087
930	1	(Konstante)	68,038	3,785		17,976	,000
		Quality Rate	,044	,089	,085	,495	,624
931	1	(Konstante)	73,390	5,196		14,124	,000
		Quality Rate	,117	,102	,201	1,143	,262
932	1	(Konstante)	86,258	6,886		12,526	,000
		Quality Rate	-,134	,117	-,212	-1,150	,260
933	1	(Konstante)	84,550	5,848		14,458	,000
		Quality Rate	-,027	,131	-,041	-,203	,841
934	1	(Konstante)	55,014	7,928		6,939	,000
		Quality Rate	,092	,127	,169	,727	,477
1302	1	(Konstante)	51,156	7,544		6,781	,000
		Quality Rate	,379	,128	,442	2,954	,006
1316	1	(Konstante)	89,618	14,868		6,027	,000
		Quality Rate	-,078	,199	-,118	-,395	,700
1318	1	(Konstante)	73,065	9,994		7,311	,000
		Quality Rate	-,034	,150	-,061	-,229	,822
1487	1	(Konstante)	61,471	8,974		6,850	,000
		Quality Rate	,297	,181	,379	1,636	,121
1657	1	(Konstante)	66,222	34,493		1,920	,091
		Quality Rate	,121	,429	,100	,283	,784
2006	1	(Konstante)	52,699	11,202		4,705	,001
		Quality Rate	,134	,149	,252	,902	,385
2743	1	(Konstante)	57,524	22,828		2,520	,036
		Quality Rate	,125	,315	,139	,396	,702
2846	1	(Konstante)	64,545	5,390		11,974	,000
		Quality Rate	,326	,070	,840	4,644	,001
2970	1	(Konstante)	58,946	5,985		9,849	,000
		Quality Rate	,069	,137	,118	,505	,620
2971	1	(Konstante)	80,039	6,001		13,338	,000
		Quality Rate	-,098	,122	-,258	-,802	,443
3062	1	(Konstante)	78,944	16,447		4,800	,001
		Quality Rate	-,161	,221	-,214	-,726	,483
3207	1	(Konstante)	79,952	9,295		8,601	,000
		Quality Rate	-,147	,165	-,300	-,889	,400
3208	1	(Konstante)	84,530	5,133		16,467	,000
		Quality Rate	,070	,090	,196	,776	,450
3463	1	(Konstante)	67,578	11,609		5,821	,000
		Quality Rate	,059	,158	,086	,375	,712
3807	1	(Konstante)	110,057	13,102		8,400	,000
		Quality Rate	-,225	,149	-,470	-1,508	,170
3881	1	(Konstante)	83,867	3,745		22,396	,000
		Quality Rate	-,086	,084	-,240	-1,020	,322
3886	1	(Konstante)	77,065	4,733		16,284	,000
		Quality Rate	,020	,093	,057	,213	,834
3942	1	(Konstante)	75,806	38,143		1,987	,072
		Quality Rate	-,752	,478	-,429	-1,573	,144
3974	1	(Konstante)	39,531	55,556		,712	,488
		Quality Rate	,147	,564	,067	,260	,798
4260	1	(Konstante)	66,168	7,690		8,605	,000
		Quality Rate	,111	,140	,194	,791	,440
4450	1	(Konstante)	76,379	4,570		16,714	,000
		Quality Rate	,018	,108	,042	,169	,868
4627	1	(Konstante)	55,056	12,432		4,428	,000
		Quality Rate	,182	,151	,297	1,205	,247
4732	1	(Konstante)	63,933	27,072		2,362	,027
		Quality Rate	,171	,279	,130	,614	,545
5199	1	(Konstante)	73,708	4,294		17,187	,000
		Quality Rate	,278	,096	,524	2,885	,009
5341	1	(Konstante)	151,199	53,233		2,840	,011
		Quality Rate	-1,258	,634	-,433	-1,983	,064

1988). According to Monroe and Krishnan (1985) most studies are not able to answer the question of a correlation between quality and price. Within this study correlations were tested for a linear regression. Based on underlying concepts from the different perspectives presented in the chapter of previous research, a more or less linear regression is expected. Nonetheless scholars also proved that the relationship is not linear (Peterson 1970; Peterson & Jolibert 1976). Additionally several studies indicate that the quality is one of the least important drivers for influencing the price (Bonner & Nelson 1985; Parasuraman, Zeithaml & Berry 1985).

No attention was given onto objective or perceived quality during the data analysis yet. Authors observed a difference between in in the context of a correlation between price and quality (Curry & Riesz, 1988). According to Hjorth-Andersen, 1984 correlation between quality and price is weaker with objective rather than perceived quality. With the quality is objective in terms of that the buyer do not know the firms in advance which do apply in tenders, correlation is supported to be weak.

The data analysis indicates strong variable correlations across different industries and product groups. Correlations vary from -0,869 for tenders from the manufacturing industry up to 1 for banking. Geistfeld, 1982 studied priceobjective quality relationship and also found differences for distinct markets.

Evaluating the correlation amongst different amounts of bids we can observe a slightly increased negative correlation and a rising significance. Unfortunately only a few tenders do have 10 or more bids to further investigate an increased direction. Conclusively there might be an increased negative correlation the more bids are retrieved within one tender. Still the correlation is almost zero and therefore less power of a relationship is supported by these findings.

All in all the division of the data into different segments supports the initial analysis in this paper that there is a correlation which is almost zero. Also significance is low and mostly not available. This paper supports authors like Monroe and Krishnan, 1985, Kirchler, Fischer and Hölzl, 2010 and Wolinsky, 1983 who observed no correlation between quality and price. Which finally will have implications on theoretical concepts which have to be questioned as well as practical implications.

7.1 Research Implications

According to the findings no correlation can be observed between quality and price. The data comes from the whole market and counts as a highly heterogeneous set of data, but even when the data is grouped into homogeneous segments, weak impact on correlation are concluded. Scholars state that homogeny data selection might strengthen the reliability of correlation between quality and prices (Gerstner, 1985; Curry & Riesz, 1988). In contrast to theory there is no increased significance on the correlation. Even the few minor significant correlations which do almost have a correlation equal to zero indicate that there is no relation measurable for quality and prices in tenders. Additionally theoretical concepts which should argue for a positive relation between quality and price might be either to be not true as an argument or not valid in the real world. For instance micro economics assumes a perfect information symmetry in the economy which is in practice a utopian idea. The results of this study do not prove if the theory of micro economics is useless, as it is just a modeled world to simplify complex mechanisms. But in contrast to the general belief of higher quality leads to higher prices, the findings give evidence that this is not the case for tenders at least.

7.2 Management Implications

Wolinsky, 1983 assumes information asymmetry as an cause for a nonexistent correlation between quality and prices. In contrast to regular customers, purchasers in tenders directly ask for quality aspects by themselves. Additionally the supplier is awarded by a formula which takes these requirements into account. Still if a buyer requires wrong or meaningless quality needs for a product or service, the tendered good or service is rated on a wrong basis. This ultimately leads towards a fuzzy quality price correlation, when the actual quality is different to the measured one. In this case a lack of expertise across buyers may lead to awarding a supplier who would not have got the highest score if quality needs were accurately set by the buyer in advance. Lambert, 1972 investigates the consumers' ability to detect quality variation among products. Prices may be used more often if the consumer lacks of sufficient product knowledge to assess the different variations of quality (French, Williams, and Chance 1973). This assumption would suggest being a reason for low correlations and significances across tenders.

John, Scott, and Bettman (1986) conclude a difference of believe across buyers in the quality price relationship. Thus this non-believe leads to lower interest in quality. As in the dataset of this study a weight is given to quality versus price we have only that consumers differ in their beliefs about the association between the price and quality variables. Within our data we have 62 tenders with an average weight of 77% where the weight of the price is set over 70% in comparison to quality. On the other hand 74 tenders with an average weight of 72% for quality have a quality weight of 70% or more. Furthermore we have 221 tenders with a higher weight in quality than in price. The mean for weight is 50,21% in quality and 49,79% in price for all tenders.

8. LIMITATIONS AND FURTHER RESEARCH RECOMMENDATIONS

For operationalization the variables price and quality are calculated on a rating scale from 0% to 100%. With every tender has at least 100% scores one for the lowest price and one for the best quality, it can be understood as no better price or quality is available. Also suppliers need to apply for tenders, rather that the buyer is searching for possible suppliers and contact them. Thus the outcomes may only count for tenders and are not universally applicable. For usual customer-buyer relations a possible correlation might be the case.

Buyers are expected to know exactly what quality is and to choose their desired quality properly. I assume that customers do not always know what quality is and also what quality they need, this also includes the proper weighting of different quality aspects (Curry & Riesz, 1988). Additionally as many quality requirements vary across buyers within the in this paper used tenders homogeneity is still to some extent limited. For tenders which are more homogenous in their requirements like temporary labor a high homogeneity is assumed as quality aspects are heavily similar and comparable as a CV, list of grades and work experience are almost expected from every buyer.

Further research recommendations are to collect data from tenders from one buyer for a specific product group or service which will be announced from time to time again. Correlation is highly diversified for individuals (Shapiro, 1973). Within this tender quality requirements should not vary, thus a highly homogenous group of data will be available, which is then only limited by the different points in time when the tenders are announced. A standard product or service which is less likely to change or innovate over time is highly recommended. Gerstner (1985) found a weak relationship across products and concluded that the relationship appeared to be product-specific. In addition if a standard product or service is observed, there might be no need to operationalize quality and prices, which lead to less 100% ratings and provide increased reliability of the data. Furthermore this study has not given attention to the expertise of a buyer. The more experience and knowledge the buyer has the less characteristics of information asymmetry will be present. Within a perfect market the buyer has full knowledge about suppliers and therefore can easily assess quality and prices. An expected correlation may occur if buyers

have full information and tender the right quality needs. Trainings for buyers and well chosen employees could also lead to higher degree of correlations.

Not only the buyers expertise but also the expertise of the marketers can lead to a non explainable price, for instance if a cost-plus pricing is favorable but the marketer calculates wrong costs or adds a too high or low profit margin on top. Thus comparability of different suppliers becomes almost impossible. Especially for smaller firms like craftsman's establishments invested resources in a proper marketing and pricing strategy might lead to wrong prices and quality measures.

Additional investigation about tenders may include reasons, why no correlation can be found. For instance this paper focus on the reason that tenders are not homogenous enough to measure a significant relation. Furthermore scoring models are expected to not affect the relationship. Thus further research of a quality price relationship could differentiate between scoring models which are used for each tender and divide the data further more into homogenous groups.

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Appendix A

Table 3, correlation products

		PriceRatePro duct
PriceRateProduct	Korrelation nach Pearson	
	Signifikanz (2-seitig)	
	N	47
QualityRateProduct	Korrelation nach Pearson	,111
	Signifikanz (2-seitig)	,01
	N	45

*. Die Korrelation ist auf dem Niveau von 0,05 (2-seitig) signifik

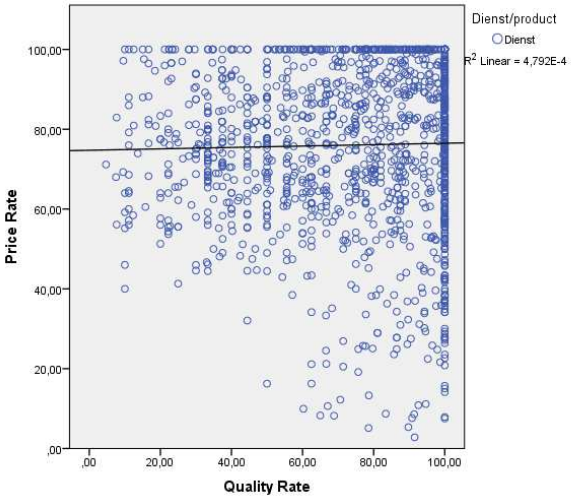

Figure 4, Scatterplot services

Table 4, Correlation services

		PriceRateSer vice	QualityRateS ervice
PriceRateService	Korrelation nach Pearson	1	,022
	Signifikanz (2-seitig)		,412
	N	1426	1409
QualityRateService	Korrelation nach Pearson	,022	1
	Signifikanz (2-seitig)	,412	
	N	1409	1409